

## **REMARKS**

### **Status Of Application**

Claims 1-24 are pending in the application; the status of the claims is as follows:

Claims 4-7, 11-14, 16, and 19-22 are withdrawn from consideration;

Claims 1, 3, 8, 10, 15, 17, and 18 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Wu, U.S. Patent No. 5,260,826; and

Claims 2, 9, 23, and 24 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Wu in view of Karasaki et al., U.S. Patent No. 4,908,504 ("Karasaki").

### **35 U.S.C. § 103(a) Rejections**

The rejection of claims 1, 3, 8, 10, 15, 17, and 18 under 35 U.S.C. § 103(a), as being unpatentable over Wu, is respectfully traversed based on the following.

The claims of the present patent application are directed to various image pickup devices and to input optical systems for use with image sensors. An objective in the pending claims is to provide a system that directs light onto the sensing region of the sensor while reducing light incident on an image sensor outside of the sensing region of the sensor.

This concept can be seen in claim 1, which recites:

An image pickup device comprising:  
    an image sensor having rectangular light receiving portions arranged in a matrix, and microlenses disposed in correspondence with said light receiving portions, said light receiving portions and said microlenses being formed integrally with each other; and  
    an image input optical system for forming an image on said image sensor, said image input optical system including a diaphragm;  
    wherein the diaphragm has a shape in a vertical direction that coincides with a shape of said light receiving portions of said image sensor, said diaphragm restricting light along a horizontal direction to prevent the light from being incident outside the light receiving portions of

the image sensor, and said diaphragm and the light receiving portions of said image sensor are in a conjugate relationship.  
(emphasis added)

Thus, as seen above, claim 1 requires an image sensor that includes microlenses formed integrally with the light receiving portions of the image sensor. Claim 1 also requires an input optical system including a diaphragm which is configured in a way to be in conjugate relationship with the light receiving portions of the image sensor.

The Wu patent does not disclose or suggest the limitations of claim 1.

As an initial matter, Wu does not disclose an image sensor as claimed. On page 2 of the Office Action, the Examiner points to element 24 saying it is an "image sensor." However, as disclosed in Wu at col. 4, line 18, element 24 is a "pixel filter array," not an image sensor. Specifically, Wu describes the pixel filter array as:

The pixel filter array 24 includes a plurality of individual pixel filters comprising exemplary microlens 27, absorbent channel 29, and pinhole 31 aligned on exemplary pixel axis 11'. (col. 3, lines 53-56)

When light from an object element in the predetermined object focal plane is incident the pixel filter array 24, the image focal plane 22 coincides with exemplary microlens 27 of the microlens array 26, and the microlens refocuses the plane wavefront of the focused spot and directs the beam through the corresponding absorbent channel 29 of the absorbent channel array 28 and through the corresponding pinhole 31 of the pinhole array 30 with small attenuation. (col. 7, lines 17-25)

Thus, Wu teaches that the pixel filter array 24 is an optical element in the optical system, not an image sensor. Thus, Wu fails to disclose this aspect of claim 1.

Claim 1 requires an image sensor having "light receiving portions [of the image sensor] and said microlenses being formed integrally with each other." Wu does not disclose or suggest such an image sensor.

In finding this limitation, the Office Action says that the pixel filter array 24 includes “circular light receiving portions arranged in a matrix, and microlenses (26) disposed in correspondence with said light receiving portions (24).” This is not correct.

The structure disclosed in Wu includes circular microlenses – not microlenses disposed in correspondence with [circular] light receiving portions of an image sensor. Thus, Wu fails to disclose this aspect of claim 1.

Claim 1 also requires a diaphragm in the optical system that is positioned so that “said diaphragm and the light receiving portions of said image sensor are in a conjugate relationship.” Wu does not disclose this.

Wu acknowledges that a “detector” might be positioned at the pinhole array 30. (col. 7, line 38-39). However, Wu does not disclose, suggest or teach the location or arrangement of the detector. Wu does not describe the location of light receiving portions of the detector. Wu does not disclose any relationship between the detector, or portions if it, with respect to elements in the optical system. Given no description of the detector, Wu certainly cannot disclose that light receiving portions of the detector (assuming for the sake of argument that it has these) are positioned so as to be in a conjugate relationship with the diaphragm, as required by claim 1. Thus, Wu fails to disclose this aspect of claim 1.

As set forth above, Wu fails to disclose or suggest many aspects of claim 1 of the present application. Accordingly, Wu is unable to render obvious the invention of claim 1. Claim 3 depends from claim 1 and is nonobvious over Wu for at least the same reasons as claim 1.

Next, the rejection of claims 8 and 10 over Wu are addressed. Claim 8, as now presented, recites:

An image input optical system for forming an image on an image sensor which has rectangular light receiving portions arranged in a matrix, and microlenses disposed in correspondence with said light receiving portions, said light receiving portions and said microlenses being formed integrally with each other, comprising:

at least one lens element; and

a diaphragm whose shape in a vertical direction coincides with a shape of said light receiving portions of said image sensor, said diaphragm restricting light along a horizontal direction to prevent the light from being incident outside the light receiving portions of the image sensor;

wherein said diaphragm is positioned so that said diaphragm and light receiving portions of said image sensor, positioned with respect to said image input optical system to have an image formed thereon, are in a conjugate relationship.

(emphasis added)

As seen above, claim 8 requires an image input optical system having certain characteristics, including characteristics adapting it to work with a particular type of image sensor. Specifically, as seen above, the image input optical system is for forming an image on an image sensor of the type having “light receiving portions and said microlenses being formed integrally with each other.” As discussed above with respect to claim 1, the Wu reference does not disclose or suggest an image sensor of this type. The component pointed to in the Office Action is a “pixel filter array,” not an image sensor. Wu does not disclose in any fashion an image sensor having “light receiving portions and said microlenses being formed integrally with each other,” as required by claim 8. Thus, Wu fails to disclose this aspect of claim 8.

Claim 8 also requires a diaphragm that works in cooperation with the lens element so that “said diaphragm is positioned so that said diaphragm and light receiving portions of said image sensor, positioned with respect to said image input optical system to have an image formed thereon, are in a conjugate relationship.” Again, Wu does not disclose this.

As note above with respect to claim 1, Wu does not provide any description of light receiving portions of an image sensor. Wu does not provide any description of a location or arrangement of a sensor. And, Wu does not provide any description of any

optical relationship between light receiving portions of the detector (assuming for the sake of argument that it has these) so as to be in a conjugate relationship with the diaphragm, as required by claim 8. Thus, Wu fails to disclose this aspect of claim 8.

Because Wu does not disclose, suggest or teach many aspects of claim 8 of the present application, Wu is unable to render obvious the invention of claim 8, or claim 10 which depends therefrom.

Next, the rejection of claim 15 over Wu is addressed. Claim 15, as now presented, recites:

An image pickup device comprising:  
an image sensor having rectangular light receiving portions arranged in a matrix, charge transferring portions adjoining said light receiving portions, and microlenses disposed in correspondence with said light receiving portions, said light receiving portions, said charge transferring portions and said microlenses being formed integrally with each other; and  
an image input optical system for forming an image on said image sensor, said image input optical system including a diaphragm;  
wherein the diaphragm . . . restricting light along a direction perpendicular to the direction along which said charge transferring portions of the image sensor are positioned to prevent the light from being incident on the charge transferring portions of the image sensor, and said diaphragm and the light receiving portions of said image sensor are in a conjugate relationship.  
(emphasis added)

Thus, as seen above, claim 15 requires an image sensor that includes microlenses formed integrally with the light receiving portions and with the charge transferring portions of the image sensor. Claim 15 also requires an input optical system including a diaphragm which is configured in a way to be in conjugate relationship with the light receiving portions of the image sensor.

The Wu patent does not disclose or suggest the limitations of claim 15.

As discussed above with respect to claim 1, the Wu reference does not disclose or suggest an image sensor of this type. The component pointed to in the Office Action is a “pixel filter array,” not an image sensor. Wu does not disclose in any fashion an image sensor having “light receiving portions, said charge transferring portions and said microlenses being formed integrally with each other,” as required by claim 15. Thus, Wu fails to disclose this aspect of claim 15.

Claim 15 also requires a diaphragm in the optical system that is positioned so that “said diaphragm and the light receiving portions of said image sensor are in a conjugate relationship.” Wu does not disclose this.

As note above with respect to claim 1, Wu does not provide any description of light receiving portions of an image sensor. Wu also fails to disclose the presence or location of charge transferring portions of an image sensor. Wu does not provide any description of a location or arrangement of a sensor or its parts. And, Wu does not provide any description of any optical relationship between light receiving portions of the detector (assuming for the sake of argument that it has these) so as to be in a conjugate relationship with the diaphragm, as required by claim 15. Thus, Wu fails to disclose this aspect of claim 15.

Wu also fails to disclose or suggest that the components “are positioned to prevent the light from being incident on the charge transferring portions of the image sensor,” as required by claim 15. Thus, Wu also fails to disclose this aspect of claim 15.

Wu fails to disclose or suggest many aspects of claim 15 of the present application and is thus unable to render obvious the invention of claim 15.

Next, the rejection of claims 17 and 18 over Wu are addressed. Claim 17, as now presented, recites:

Application No. 09/377,667  
Amendment dated \_\_\_\_\_  
Reply to Office Action of November 16, 2005

An image pickup device comprising:  
an image sensor having rectangular light receiving portions arranged in a matrix, and microlenses disposed in correspondence with said light receiving portions, said light receiving portions and said microlenses being formed integrally with each other; and  
an image input optical system for forming an image on said image sensor, said image input optical system including a light controlling means;  
wherein the light controlling means . . . restricting light along a horizontal direction to prevent the light from being incident outside the light receiving portions of the image sensor, and said light controlling means and the light receiving portions of said image sensor are in a conjugate relationship. (emphasis added)

Thus, as seen above, claim 17 requires an image sensor that includes microlenses formed integrally with the light receiving portions of the image sensor. Claim 17 also requires an input optical system including a light controlling means which is configured in a way to be in conjugate relationship with the light receiving portions of the image sensor.

The Wu patent does not disclose or suggest the limitations of claim 17.

As discussed above with respect to claim 1, the Wu reference does not disclose or suggest an image sensor of this type. The component pointed to in the Office Action is a "pixel filter array," not an image sensor. Wu does not disclose in any fashion an image sensor having "light receiving portions and said microlenses being formed integrally with each other," as required by claim 17. Thus, Wu fails to disclose this aspect of claim 17.

Claim 17 also requires a light controlling means in the optical system that is positioned so that "said light controlling means and the light receiving portions of said image sensor are in a conjugate relationship." Wu does not disclose this.

As note above with respect to claim 1, Wu does not provide any description of light receiving portions of an image sensor. Wu does not provide any description of a location or arrangement of a sensor or its parts. And, Wu does not provide any description

Application No. 09/377,667  
Amendment dated \_\_\_\_\_  
Reply to Office Action of November 16, 2005

of any optical relationship between light receiving portions of the detector (assuming for the sake of argument that it has these) so as to be in a conjugate relationship with the light controlling means, as required by claim 17. Thus, Wu fails to disclose this aspect of claim 17.

Because Wu does not disclose, suggest or teach many aspects of claim 17 of the present application, Wu is unable to render obvious the invention of claim 17, or claim 18 which depends therefrom.

Accordingly, in view of the foregoing, it is respectfully requested that the rejection of claims 1, 3, 8, 10, 15, 17, and 18 under 35 U.S.C. § 103(a) as being unpatentable over Wu, be reconsidered and withdrawn.

The rejection of claims 2, 9, 23, and 24 under 35 U.S.C. § 103(a), as being unpatentable over Wu in view of Karasaki et al., is respectfully traversed based on the following.

Claims 2 and 23 depend from claim 1, claims 9 and 24 depend from claim 8.

As discussed above with respect to the rejection of claims 1 and 8 over Wu, the Wu reference does not suggest very element of the independent claims and thus fails to render obvious either of claims 1 or 8.

The present Office Action cites the Karasaki reference for the fact that a diaphragm can be oval shaped and for the proposition that the shape of a diaphragm can be decided in accordance with the effective aperture of the optical system. Regardless of whether these points are correct, Karasaki does not disclose an image sensor of the type required by claim 1. Karasaki does not disclose an image sensor of the type "light receiving portions and said microlenses being formed integrally with each other." Similarly, Karasaki does not disclose a diaphragm in the optical system that is positioned so that "said diaphragm and the light receiving portions of said image sensor are in a conjugate relationship."



Application No. 09/377,667  
Amendment dated \_\_\_\_\_  
Reply to Office Action of November 16, 2005

In view of these shortcomings, Karasaki is unable to remedy the shortcomings of Wu pointed out above. As a result, the combination of Wu and Karasaki do not disclose, suggest or teach the limitations discussed above for claim 1, and thus the combination of Wu and Karasai are unable to render obvious either claim 1 or claims 2 and 23 which depend therefrom.

Similarly, because Karasaki is unable to cure the deficiencies of Wu pointed out above, the combination of Wu and Karasaki do not disclose, suggest or teach the limitations discussed above for claim 8. As a result, the combination of Wu and Karasai are unable to render obvious either claim 8 or claims 9 and 24 which depend therefrom.

Accordingly, it is respectfully requested that the rejection of claims 2, 9, 23, and 24 under 35 U.S.C. § 103(a) as being unpatentable over Wu in view of Karasaki et al., be reconsidered and withdrawn.

In view of the foregoing remarks, this application is considered to be in condition for allowance, and an early consideration and a Notice of Allowance are respectfully requested.

This Response does not increase the number of independent claims, does not increase the total number of claims, and does not present any multiple dependency claims. Accordingly, no fee based on the number or type of claims is currently due. However, if a fee, other than the issue fee, is due, please charge this fee to Sidley Austin LLP Deposit Account No. 18-1260.

If an extension of time is required to enable this document to be timely filed and there is no separate Petition for Extension of Time filed herewith, this document is to be construed as also constituting a Petition for Extension of Time Under 37 C.F.R. § 1.136(a) for a period of time sufficient to enable this document to be timely filed.

Application No. 09/377,667  
Amendment dated \_\_\_\_\_  
Reply to Office Action of November 16, 2005

Any other fee required for such Petition for Extension of Time and any other fee required by this document pursuant to 37 C.F.R. §§ 1.16 and 1.17, other than the issue fee, and not submitted herewith should be charged to Sidley Austin LLP Deposit Account No. 18-1260. Any refund should be credited to the same account.

Respectfully submitted,

By: \_\_\_\_\_



Thomas N. Tarnay  
Registration No. 41,341  
Attorney for Applicant

TNT/llb:jkk  
SIDLEY AUSTIN LLP  
717 N. Harwood, Suite 3400  
Dallas, Texas 75201  
Direct: (214) 981-3388  
Main: (214) 981-3300  
Facsimile: (214) 981-3400  
February 9, 2006